

# SLS

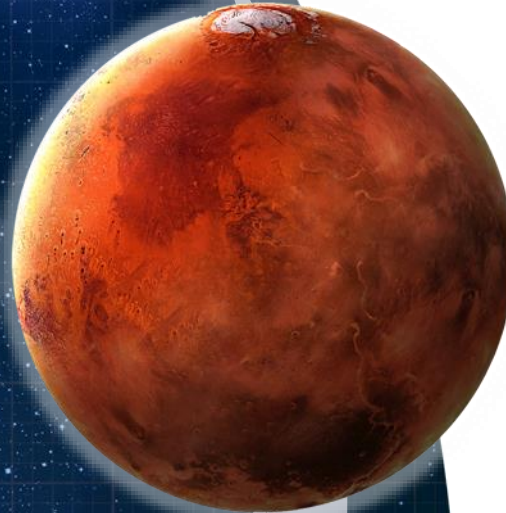
## Secondary Payloads

**Jody Singer**  
Deputy Center Director

Joseph Pelfrey  
George Norris

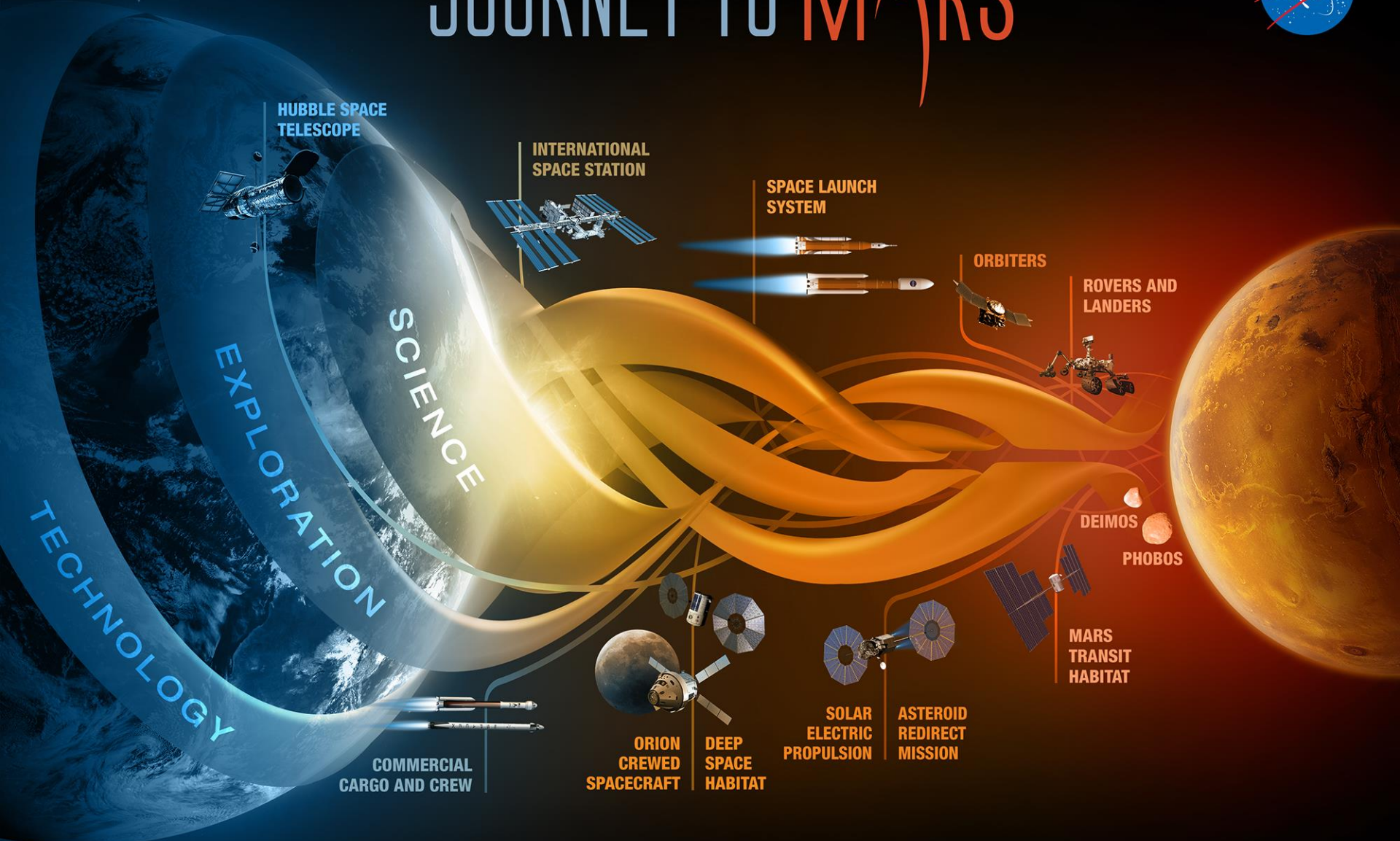
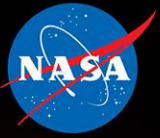
**SpaceOps 2016**  
Daejeon, Republic of Korea

National Aeronautics and  
Space Administration



**MARSHALL**  
SPACE FLIGHT CENTER

# JOURNEY TO MARS



HUBBLE SPACE  
TELESCOPE

INTERNATIONAL  
SPACE STATION

SPACE LAUNCH  
SYSTEM

ORBITERS

ROVERS AND  
LANDERS

DEIMOS  
PHOBOS

MARS  
TRANSIT  
HABITAT

ASTEROID  
REDIRECT  
MISSION

SOLAR  
ELECTRIC  
PROPULSION

ORION  
CREWED  
SPACECRAFT  
DEEP  
SPACE  
HABITAT

COMMERCIAL  
CARGO AND CREW

TECHNOLOGY  
EXPLORATION  
SCIENCE



















# SLS

## **Capability**

>70 metric tons

## **Height**

98.2 meters

## **Weight**

2.6 million kilograms

## **Thrust**

39.1 million newtons

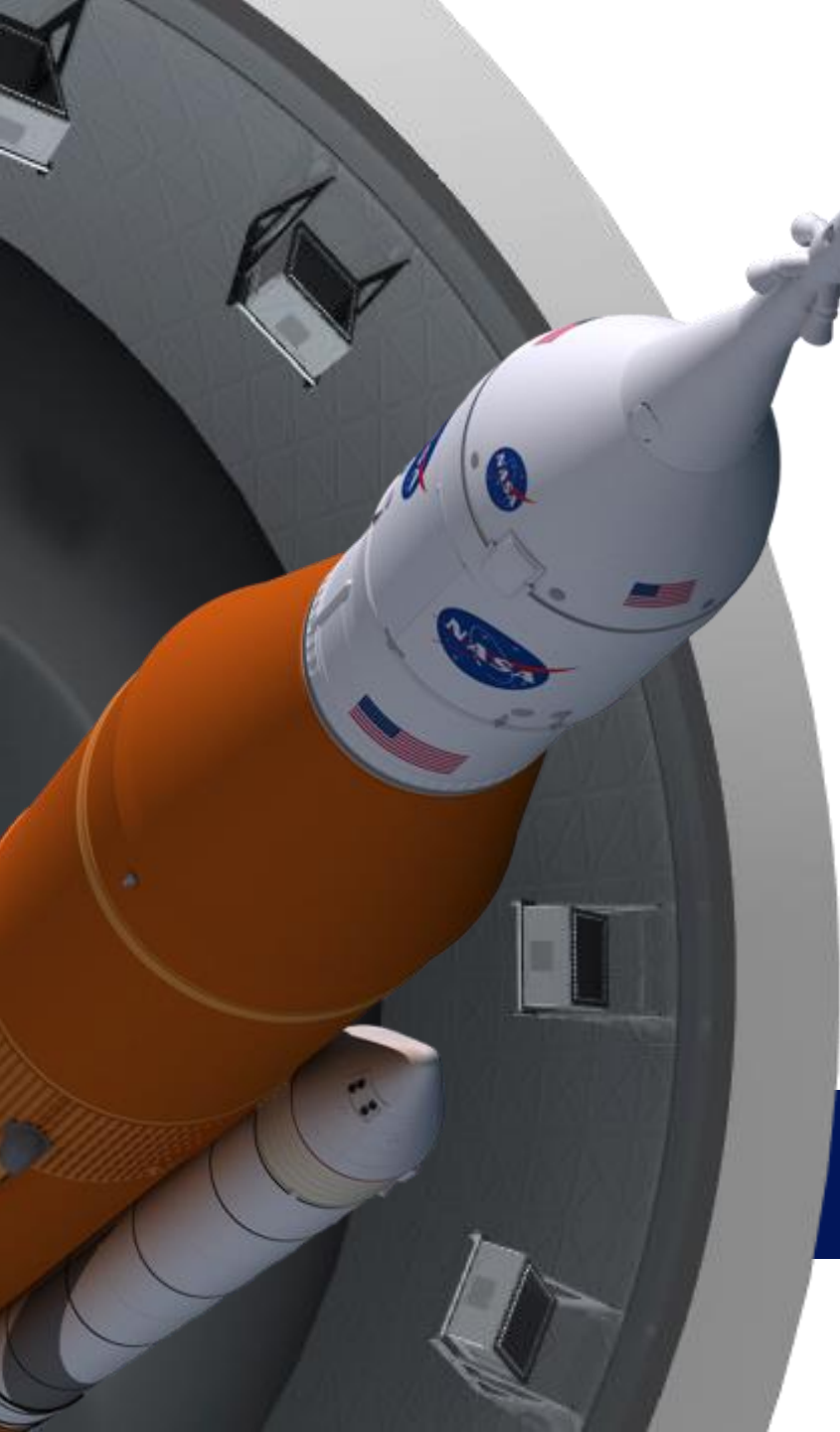
Available in 2018



- Initial demonstration of SLS and Orion capabilities
- Launch uncrewed Orion into distant retrograde orbit around the moon

## Exploration Mission-1





- 13 payload locations on EM-1
- 6U volume
- 14 kg
- Developed in partnership with NASA, academia, international, and commercial organizations
- First time smallsats deployed in deep space

Capability for Secondary Payloads







# Science and Technology

Reconnaissance and  
characterization of an asteroid  
using solar sail propulsion

- NEA Scout

Near-Earth Asteroid



# Science and Technology

- Mapping the lunar surface
- Searching for resources such as water, hydrogen, and other resources
- Observing radiation and soil mechanics
  - Lunar Flashlight
  - Lunar IceCube
  - LunaH Map

Moon



A satellite image of Earth, showing North America, the Atlantic Ocean, and parts of Europe and Africa. The image is curved, following the edge of the globe.

# Science and Technology

Imaging Earth's plasmasphere to study radiation and sensor experimentation

- Skyfire

Earth



# Science and Technology

Studying space weather events long before they reach Earth

- CubeSat Mission to Study Solar Particles (CuSP)

Heliophysics





# Science and Technology

Measuring the biological response to space radiation outside low-Earth orbit using single-celled yeast

- BioSentinel

Deep Space



# **NASA's Centennial Challenges**

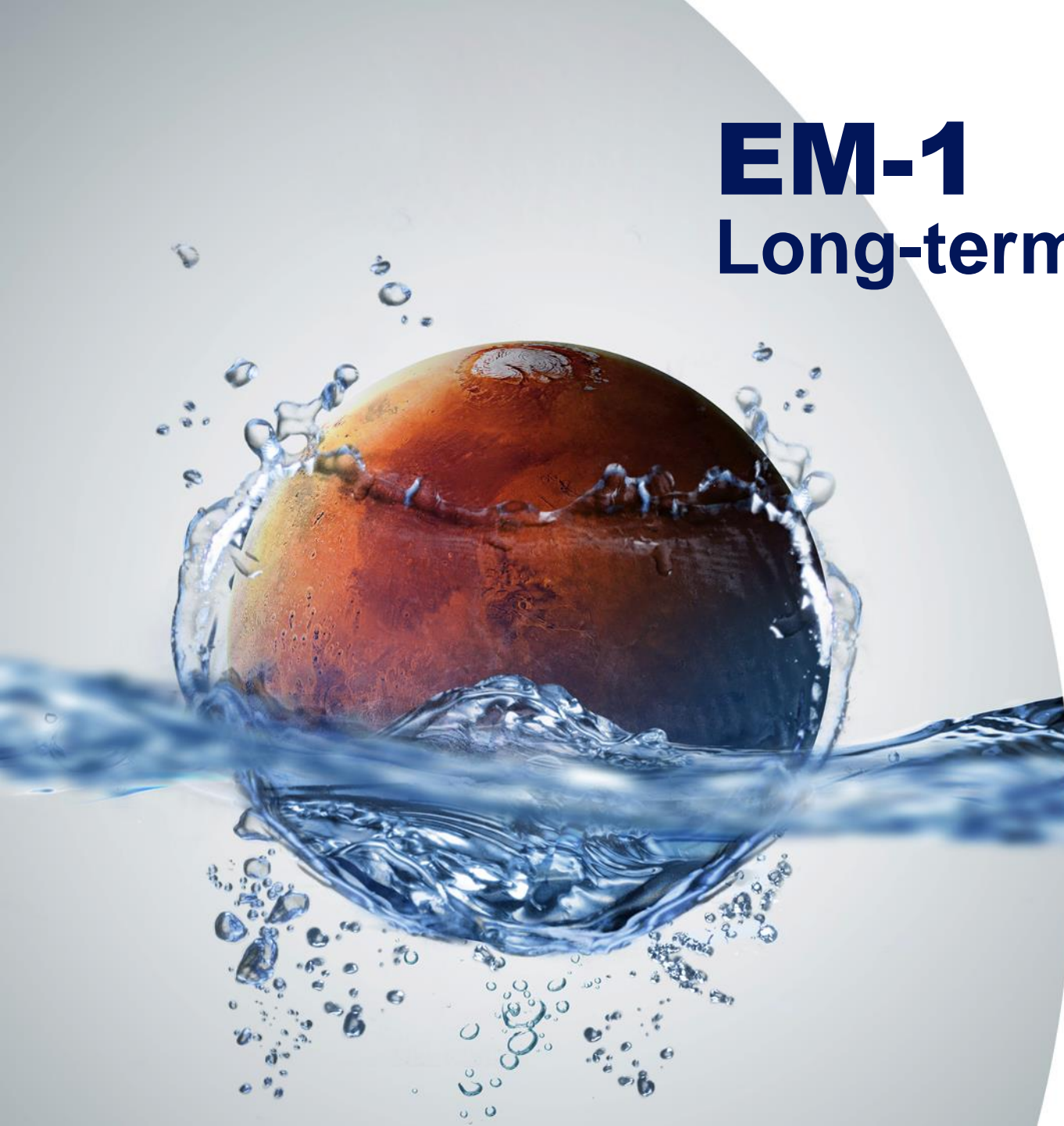
Three slots on SLS's EM-1 are allocated for the winners of the CubeQuest Challenge.

## **CubeQuest Challenge**



# **EM-1**

## **Long-term Benefits**



# Evolvable Design



5m fairing w/ science payload



Science Missions



Orion with short-duration hab module



8m fairing with large aperture telescope



10m fairing w/notional Mars payload

total mission volume = ~ 250m<sup>3</sup>

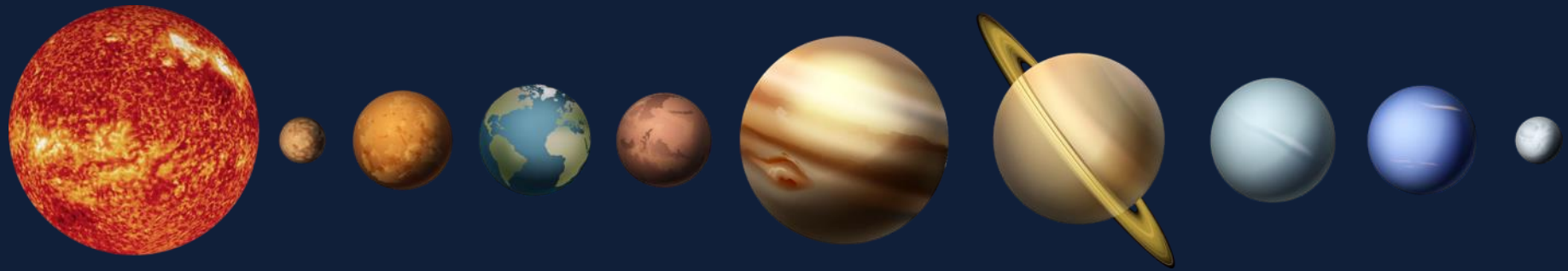
400m<sup>3</sup>

400m<sup>3</sup>

1200m<sup>3</sup>

1800m<sup>3</sup>





# **Future Destinations**

**One launch...**

**more science and technology**







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# Join Us on the Journey